

3D modelling for digital archive of monuments that records historical Nankai earthquakes at Kochi Prefecture

*Wataru Tanikawa¹, Uramoto Go-Ichiro¹, Shoichiro Uchiyama², Arata Orinaka³, Tadashi Yamashina³, Keisuke Okamoto⁴, Tadashi Hara³

1.Japan Agency for Marine-Earth Science and Technology, Kochi Institute for Core Sample Research, 2.National Research Institute for Earth Science and Disaster Prevention, 3.Kochi University, 4.Kochi Prefectural Museum of History

Nankai earthquakes have occurred repeatedly along southwest Japan. In Kochi Prefecture, historical disasters about the great Nankai earthquakes are recorded in the local stone monuments. There are at least 25 monuments in Kochi Prefecture which are related to Nankai earthquakes from Hoei (in 1707) to Showa (in 1946) era, and especially the most monuments are related to the Ansei Tokai and Ansei Nankai great earthquakes (in 1855). The earthquake monuments are regarded not only as memorial and cenotaph but also as highly valuable historical documents. However, weathering by wind, rain, and vegetation could have damaged the stone monuments and made us difficult to read the several characters on them. In addition, most of the monuments in Kochi Prefecture, which are owned by local people and temples, not by public institutions, have to be conserved individually. Therefore, we may lose the stone monuments by natural disasters such as future Nankai earthquakes. In this project, we construct three-dimensional digital images of the stone monuments for the preservation of the historical records on the earthquake monuments in Kochi Prefecture, and provide information that links the moments and location on the web browser. We then promote to use our content as an education for disaster prevention so that the future generation can inherit the disastrous earthquake history.

The stone monuments have been researched mainly in deciphering the content of the characters engraved on the stones. However, rock physical/chemical properties (such as mineral composition, color, and magnetic susceptibility) and shapes also contain the cultural background at the era when the monuments were built. Therefore, in this project, we construct the three-dimensional digital image of the monuments and measure the rock physical/chemical properties, and then, to publish the information on the web.

We used the commercial software (PhotoScan, Agisoft company) to reconstruct 3D models from digital photo images. Photos were taken by compact digital camera (GR, RICOH imaging company). We plan to view 3D images on web or ask to download to personal computers. Large numbers of face are necessary to display the characters on monuments clearly, though, it may take time to display in browser. Therefore we use the existing platform (Sketchfab, <https://sketchfab.com/>) that can display and share 3D models based on the WebGL technology. 3D pdf were chosen as format to view 3D models on PC. Spectrophotometer (CM-700d, KONICA MINOLTA Inc.) were used to measure the color, and magnetic susceptibility were measured by KT-10 S/C (Terraplius inc.).

In this presentation, we report our project on progress and preliminary data.

Keywords: stone monument, digital archive, education for disaster prevention, Nankai Earthquake, SfM-MVS